

Virtual Keyboard for Hands-Free Operations

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The main objective of this research effort is to design an intelligent, hands-free, computer-input device for both space and commercial applications. The “virtual keyboard” can be used for future manned spacecraft or any environment that requires hands-free computer operations, e.g., a manufacturing environment. Another application, from which this idea was initially motivated, is in the area of providing an interface for the physically challenged: paraplegics, quadriplegics, and individuals with degenerative motor functions (fig. 7).

This project is currently being funded by the Center Director’s Discretionary Fund, and the expected date of completion is December 1996. The first phase of research will investigate state-of-the-art technologies in eye tracking. During requirements definition, human factor issues related to perception, oculomotor capabilities, and learning will be carefully considered to help define verifiable system performance requirements. Thorough design analysis and human factor tests will be performed to determine an optimal configuration and design. During verification, the system will be tested to gauge the degree to which it satisfies the design requirement. Following verification, the system will be evaluated empirically with a variety of human subjects under various operational modes. Actual evaluation criteria and

operational modes will be finalized during the experimental design, and will include such items as eye tracking and selection resolution, accuracy, and repeatability; required training/learning time; fatigue effects; and environmental effects (e.g., ambient illumination and glare). The end product will be prototype hardware and software that demonstrate the feasibility of hands-free computer-input operations. In addition to the eye-tracking-driven interface, research will be performed to investigate the feasibility of using electroencephalogram data.

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FIGURE 7.—Virtual keyboard.